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Date: August 13, 2004

Name: M. Collins

Signature:

Attorney Docket No.: 12400-007

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s): Qvint et al. )  
Serial No.: 10/791,496 )  
Filing Date: 3/02/04 )  
Group Art Unit: Unknown )  
Title: Safety Device )

TRANSMITTAL OF  
PRIORITY DOCUMENT

Commissioner of Patents  
U.S. Patent and Trademark Office  
P.O. Box 1450  
Alexandria, VA 22313-1450

Dear Sir:

The following documents are being transmitted herewith for filing in the above-referenced application.

1. Priority Document of British Application No. 0400779.5.
2. Priority Document of British Application No. 0305164.6

Respectfully submitted,

By:

Steven L. Oberholtzer  
Reg. No.: 30,670

SLO:mc

Brinks Hofer Gilson & Lione  
P.O. Box 10395  
Chicago, IL 60610  
(734) 302-6000

Dated: August 13, 2004



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, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation and Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents originally filed in connection with the patent application identified therein together with the statement of inventorship and of right to grant of a Patent (Form 7/77), which was subsequently filed.

In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in this certificate and any accompanying documents has re-registered under the Companies Act 1980 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name in which it is so re-registered.

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*AmBrewster*

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I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation and Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein together with the Statement of inventorship and of right to grant of a Patent (Form 7/77), which was subsequently filed.

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*AmBrewster*

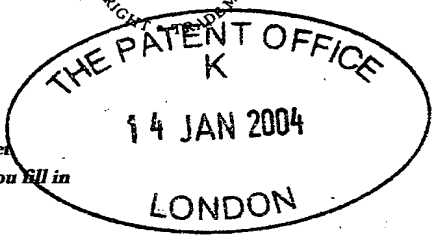
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**Request for grant of a patent**  
*(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)*

**The Patent Office**  
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South Wales  
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1. Your reference P18393GB - NHF/ns

2. Patent application number  
*(The Patent Office will fill this part in)* 0400779.5 14 JAN 2004

3. Full name, address and postcode of the or of each applicant *(underline all surnames)* AUTOLIV DEVELOPMENT AB  
S-447 83 VARGARDA  
SWEDEN

Patents ADP number *(if you know it)* 321018012

If the applicant is a corporate body, give the country/state of its incorporation SWEDEN

4. Title of the invention IMPROVEMENTS IN OR RELATING TO A SAFETY DEVICE

5. Name of your agent *(if you have one)* Forrester Ketley & Co.

"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)* Forrester House  
52 Bounds Green Road  
London  
N11 2EY

Patents ADP number *(if you know it)* 133001 ✓

6. Priority: Complete this section if you are declaring priority from one or more earlier patent applications, filed in the last 12 months.	Country	Priority application number	Date of filing
	UK	<i>(if you know it)</i> 035164.6	<i>(day / month / year)</i> 6 March 2003

7. Divisionals, etc: Complete this section only if this application is a divisional application or resulted from an entitlement dispute (see note f)	Number of earlier UK application	Date of filing
		<i>(day / month / year)</i>

8. Is a Patents Form 7/77 (Statement of inventorship and of right to grant of a patent) required in support of this request?

Answer YES if:

a) any applicant named in part 3 is not an inventor, or Yes

b) there is an inventor who is not named as an applicant, or

c) any named applicant is a corporate body.

Otherwise answer NO (See note d)

**Patents Form 1/77**

9. Accompanying documents: A patent application must include a description of the invention. Not counting duplicates, please enter the number of pages of each item accompanying this form:

Continuation sheets of this form

Description 11 ✓

Claim(s) 4 ✓

Abstract 1 ✓

Drawing(s) 5+5 R

10. If you are also filing any of the following, state how many against each item.

Priority documents

Translations of priority documents

Statement of inventorship and right to grant of a patent (Patents Form 7/77)

Request for a preliminary examination and search (Patents Form 9/77) 1 ✓

Request for a substantive examination (Patents Form 10/77)

Any other documents (please specify)

11. I/We request the grant of a patent on the basis of this application.

Signature(s) Forrester Ketley & Co.

Date 14 January 2004

12. Name, daytime telephone number and e-mail address, if any, of person to contact in the United Kingdom

Forrester Ketley & Co

FRANKLAND, Nigel H.

(020) 8889 6622

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- If there is not enough space for all the relevant details on any part of this form, please continue on a separate sheet of paper and write "see continuation sheet" in the relevant part(s). Any continuation sheet should be attached to this form.
- If you have answered YES in part 8, a Patents Form 7/77 will need to be filed.
- Once you have filled in the form you must remember to sign and date it.
- Part 7 should only be completed when a divisional application is being made under section 15(4), or when an application is being made under section 8(3), 12(6) or 37(4) following an entitlement dispute. By completing part 7 you are requesting that this application takes the same filing date as an earlier UK application. If you want the new application to have the same priority date(s) as the earlier UK application, you should also complete part 6 with the priority details.



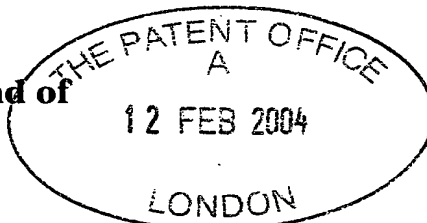
**Patents Form 7/77**

Patents Act 1977  
(Rule 15)



13FEB04 8155701-2 000389  
P07/7700 0-00-0400779.5 NONE

**Statement of inventorship and of  
right to grant of a patent**

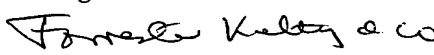


**The Patent Office**

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1. Your reference P18393GB-NF/jsd
2. Patent application number 0400779.5  
*(if you know it)*
3. Full name of the or of each applicant Autoliv Development AB
4. Title of the invention Improvements in or Relating to a Safety Device
5. State how the applicant(s) derived the right from the inventor(s) to be granted a patent By Agreement
6. How many, if any, additional Patents Forms 7/77 are attached to this form?  
*(see note (c))*
7. 

☒ We believe that the person(s) named over the page (and on any extra copies of this form) is/are the inventor(s) of the invention which the above patent application relates to.

Signature  
  
Forrester Ketley & Co.

Date  
12 February, 2004
8. Name and daytime telephone number of person to contact in the United Kingdom (020) 8889 6622 FRANKLAND, Nigel H.

**Notes**

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Enter the full names, addresses and postcodes of the inventors in the boxes and underline the surnames

QVINT, Peter,  
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174599001

Patents ADP number (if you know it):

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SE-447 30 VARGARDA,  
Sweden.

2257327 003

Patents ADP number (if you know it):

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Patents ADP number (if you know it):

PATENTS ACT 1977

P18393GB-NF/jsd

5 DESCRIPTION OF INVENTION

**“IMPROVEMENTS IN OR RELATING TO A SAFETY DEVICE”**

10

**THE PRESENT INVENTION** relates to a safety device.

15

It has been proposed to provide various forms of safety device to provide protection for an occupant of a vehicle in the event that an accident should occur. For example, various types of air-bag have been proposed which, depending upon their design, may occupy many different positions within a vehicle relative to a driver. When an air-bag is to be deployed, a gas generator is actuated which generates gas which serves to inflate the air-bag.

20

In some cases it is desirable for the pressure in the air-bag to be controlled and/or for the air-bag to be “vented”, especially if the occupant has a weight which is not typical, either being relatively heavy or being relatively light, or, alternatively, if the occupant is “out of position” (for example leaning forwardly).

25

Various proposals have been made for mechanisms to ventilate an air-bag including controlled valves, burst discs and tear-seams which initially seal an outlet air vent. Sophisticated arrangements may include elements such as pressure sensors and/or control units to determine the weight and the position of

an occupant and to control the opening of a gas exhaust valve in an optimal manner.

However, there is a requirement for a simple device to control the  
5 ventilation of an air-bag which can be used in a flexible manner to provide ventilation at different positions within an air-bag.

Other safety devices also rely on generated gas, such as pre-tensioners, and there is a requirement for a mechanism that may be utilised to control the  
10 operation of such safety devices.

According to a first aspect of the present invention, there is provided a safety device in the form of a releasable clip, the releasable clip having a first elongate main gripping element, and a second elongate moveable gripping  
15 element, the main gripping element having a retaining element to retain one end of the moveable gripping element; there being an arrangement to retain the other end of the moveable gripping element in a predetermined position such that the clip may grip a fabric tube or the like between the main gripping element and the moveable gripping element; a mechanism being provided  
20 which responds to a supply signal to move said other end of the moveable gripping element to release the grip.

According to another aspect of the present invention, there is provided a safety device configured to be actuated by the supply of gas, the safety device  
25 incorporating an outlet vent pipe, the outlet vent pipe being sealed by a releasable clip, the releasable clip having a first elongate main gripping element, and a second elongate moveable gripping element, the main gripping element having a retaining element to retain one end of the moveable gripping element; there being an arrangement to retain the other end of the moveable

gripping element in a predetermined position such that the clip may grip the outlet vent pipe or the like between the main gripping element and the moveable gripping element; a mechanism being provided which responds to a supply signal to move said other end of the moveable gripping element to  
5 release the grip.

Preferably, the safety device is an air-bag.

Advantageously, the safety device is a pretensioner.  
10

Conveniently, a plurality of said releasable clips are provided, each clip being associated with a respective outlet hose.

Preferably, the releasable clip incorporates a spring initially held in a compressed state and released in response to said signal so as to move the said  
15 other end of the moveable retaining element.

Advantageously, the main gripping element is in the form of a cylinder, and said other end of the elongate moveable gripping element is configured to  
20 fit over or within the cylinder; there being a mechanism to supply gas to the interior of the cylinder in response to said signal to move the said other end of the moveable gripping element.

Conveniently, said other end of the moveable gripping element is  
25 constituted by a piston movable within the cylinder.

In one embodiment the cylinder has a terminal inward projection to retain the piston in the cylinder.

Preferably, said other end of the moveable gripping element comprises a closure cap dimensioned to close an open end of the cylinder.

5            Advantageously, the source of gas is a pyrotechnic squib.

Alternatively, the source of gas is a source of compressed gas.

Preferably, the moveable gripping element is provided with an elongate  
10    cylindrical gripping portion, one end of which is engaged in a retaining lug  
provided on the main gripping element.

Advantageously, the main gripping element is in the form of a  
cylindrical housing, and the moveable gripping element has inclined resiliently  
15    mounted walls to engage the exterior of the cylindrical main gripping element.

In order that the invention may be more readily understood, and so that  
further features thereof may be appreciated, the invention will now be  
described, by way of example, with reference to the accompanying drawings in  
20    which:

FIGURE 1 is a perspective view of a pyrotechnic clip unit,

FIGURE 2 is an end view of the unit of Figure 1,

25

FIGURE 3 is a sectional view, on an enlarged scale, taken on the line  
A-A of Figure 2,

FIGURE 4 is a view showing the clip unit of Figures 1 to 3 mounted on an outlet duct of an air-bag,

FIGURE 5 is a view corresponding to Figure 4 showing the clip unit  
5 when released,

FIGURE 6 is a view corresponding to Figure 1 illustrating a modified embodiment of the invention,

10 FIGURE 7 is a view illustrating an air-bag in a motor vehicle provided with a pyrotechnic clip unit of the type described above during inflation of an air-bag,

FIGURE 8 is a view corresponding to Figure 6 showing the clip unit  
15 when released, and

FIGURE 9 is a perspective view of an alternative form of clip unit in accordance with the invention.

20 Turning initially to Figures 1 to 3 of the accompanying drawings, a pyrotechnic clip unit 1 is illustrated, the pyrotechnic clip unit being configured so that, when in use, it may close an outlet hose or duct, formed of a material such as fabric, forming part of an air-bag or forming part of another safety device.

25

The clip 1 comprises an elongate hollow cylindrical housing 2 which forms a main gripping element, one end of the housing being provided with an integral deflected retaining bracket 3 in the form of a lug. The retaining bracket

3 defines a "U"-shaped slot 4 which opens into one side edge of the retaining bracket 3.

The end of the hollow cylindrical housing 2 provided with the retaining bracket 3 receives a pyrotechnic squib 5 which is held by a crimp 6 as illustrated most clearly in Figure 3. The pyrotechnic squib 5 contains a pyrotechnic charge and is associated with two electrodes 7 which are accessible from the open end of the housing 2. A plug may be connected to the electrodes 7. When a current is passed between the electrodes 7, the pyrotechnic squib 5 is ignited to generate a substantial quantity of gas.

A moveable gripping element 8 is provided, the gripping element 8 including an elongate cylindrical gripping section 9 having a terminal region 10 configured to be received within the "U"-shaped slot 4 formed in the retaining bracket 3. The other end of the gripping section 9 is provided with a 180° bend 11 which connects the gripping section 9 to a piston 12 which is dimensioned to be received, as a sliding fit, within the hollow tube 2. The piston 12 may have a semi-spherical head so as to provide a substantially sealing fit even if the piston is not precisely aligned with the longitudinal axis of the hollow cylindrical housing 2.

Referring now to Figure 4, the clip 1 of Figures 1 to 3 is shown in position on the terminal part of a tube 13 which may be a fabric tube extending from an air-bag to constitute a gas vent, or which may be a fabric tube extending from part of some other safety device which is deployed by the generation of gas.

It will be understood that the terminal part of the tube 13 has been located in position generally between the cylindrical housing 2 and the gripping



section 9 of the moveable gripping element 8. The terminal part 10 of the gripping section 9 has been manipulated to be received within the "U"-shaped slot 4 of the retaining bracket 3, thus firmly trapping the fabric of the tube 13 between the gripping section 9 of the moveable gripping element 8, and the outer surface of the cylindrical housing 2. The clip 1 thus forms a substantially air-tight seal at the end of the tube 13.

Should an appropriate electrical signal be supplied to the electrodes 7, the pyrotechnic squib 5 will be ignited generating a substantial quantity of gas within the cylinder 2. The gas will act on the piston 12 moving the piston 12 axially of the cylindrical housing 2, and thus withdrawing the terminal part 10 of the moveable gripping element 8 from the "U"-shaped slot 4 formed in the retaining bracket 3. The moveable gripping element 8 thus moves relative to the main gripping element formed by the housing 2. Indeed, the entire gripping element 8 may, as shown in Figure 5, become totally separated from the cylindrical housing 2. Thus the tube 13 is no longer retained in a sealed condition and gas may escape from the air-bag through the tube 13.

It is to be understood that a number of clips of the type described above may be provided on a typical air-bag at a number of different positions, and the actuation of the clips may be controlled by an appropriate control arrangement associated with appropriate sensors. Consequently a number of the described clips may be provided on various gas ducts 13 forming part of a single air-bag, and one or more of the clips may be released. If more than one clip is released, the clips may be released at appropriate times during an accident situation, in dependence upon the particular circumstances of an accident involving a vehicle in which the air-bag is mounted.

Whilst, in the above-described embodiment of the invention, the movable gripping element may, as shown in Figure 5, become totally separated from the cylindrical housing, in some circumstances this may be undesirable. The gripping element 8 may, if it leaves the cylindrical housing with a substantial velocity, act as a projectile which may be extremely undesirable.

Thus, in the embodiment of Figure 6, a terminal part of the cylindrical housing 2, at the end remote from the pyrotechnic squib 5, a projection which extends radially inwardly is provided, in the form of a flange 14. The flange 14 may be a flange which extends totally around the open end of the cylindrical housing 2, or may be a flange which extends only part-way around the end of the housing. The flange may be replaced by an inwardly directed crimp located adjacent the end of the housing. The flange, or crimp, form a terminal inwardly directed projection which prevents the piston 12 from escaping from within the cylinder. Thus the piston is retained within the cylinder, preventing the gripping element 8 from becoming a projectile.

Referring now to Figures 7 and 8, merely by way of an example, an air-bag 20 in the form of a so-called "inflatable curtain" is illustrated, the air-bag 20 having a forwardly extending restraining strap 21 which is in the form of a hollow tube in fluid communication with the invention of the main part of the air-bag 20. The free end of the tube is received within a clip 1 as described above, the cylindrical housing 2 of the clip 1 being securely fastened to the "A"-Post 22 of the illustrated vehicle. Thus the clip 1 seals the tubular strap 21 and also anchors the end of the strap in position.

In ordinary deployment of the inflatable curtain, gas will be injected into the inflatable parts of the inflatable curtain, but will not be able to escape through the tubular strap 21, because the tubular strap 21 is maintained closed

by the action of the clip 1. The clip 1 also holds the tubular restraining strap 21 securely in position.

Should a particular set of circumstances arise, in which it is appropriate to release the restraining strap 21 and deflate the inflatable curtain, the clip 1 may be released, in the manner described above, by actuating the pyrotechnic squib 5, as shown in Figure 7, thus releasing the end of the tubular restraining strap 21 permitting gas to escape from the inflated interior of the inflatable curtain 20 through the thus released tubular strap 21, as shown in Figure 7.

10

Whilst the invention has been described above with reference to one form of releasable clip, Figure 9 illustrates a modified form of releasable clip. The clip of Figure 9 includes a hollow tubular housing 30 forming a main gripping element and having, at one end, a deflected retaining bracket 31 in the form of a lug which defines a square aperture 32. Received within that end of the tubular housing 31 is a squib 33 corresponding to the squib 5 as described above.

Associated with the housing 30 is a moveable gripping element 34. The moveable gripping element 34 is formed of a pressed plate, the pressed plate defining two inwardly directed opposed resiliently mounted walls 35,36 having a substantially "V" configuration, the lower ends of the walls being interconnected by a "U"-shaped trough 37. At one end, the trough 37 extends axially to form a projection 38. The projection 38 is dimensioned to be received within the square aperture 32 in the retaining bracket 31. At the other end, the trough 37 carries an upstanding support 39 which extends up between the walls 35, 36, and which carries a closure cap 40 dimensioned to fit over and close, in a sealing manner, the open end of the housing 30 remote from the squib 33.

It is to be appreciated that the moveable gripping element 34 is so configured that when the projection 38 of the trough 37 is received within the aperture 32, the closure cap 40 sealingly closes the end of the housing 30 remote from the squib 33, and the walls 35, 36, due to their own resilient mounting, are biased against the exterior of the housing 30.

It will be appreciated that the clip may be mounted on a hose, equivalent to the tube 13 as shown in Figures 4 and 5, with the hose being partly wrapped around the cylindrical housing 30, and with the hose being gripped by the two resiliently biased walls 35, 36. The engagement of the projection 38 within the aperture 32, and the engagement of the sealing cap 40 with the end of the housing 30 ensures that the moveable gripping element 34 remains in position. Should, however, an electric charge be applied to the pyrotechnic squib 5, a substantial quantity of gas will be injected into the interior of the hollow housing 30, thus driving the sealing cap 40 away from the end of the housing 30 remote from the squib 33, consequently serving to withdraw the projection 38 from the aperture 32, and releasing the moveable gripping element 34 from the housing 30.

Whilst the invention has been described with specific reference to clips in which gas is generated by a pyrotechnic squib in response to a signal, it is to be understood that in a modified embodiment, instead of using the squib, a source of compressed gas that is opened by a signal may be used, or even a clip that includes a spring which is retained in a compressed state and released in response to a signal to release the clip.

In the present Specification "comprises" means "includes or consists of" and "comprising" means "including or consisting of".

The features disclosed in the foregoing description, or the following Claims, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process  
5 for attaining the disclosed result, as appropriate, may, separately, or in any combination of such features, be utilised for realising the invention in diverse forms thereof.

## CLAIMS:

1. A safety device in the form of a releasable clip, the releasable clip  
5 having a first elongate main gripping element, and a second elongate moveable  
gripping element, the main gripping element having a retaining element to  
retain one end of the moveable gripping element; there being an arrangement to  
retain the other end of the moveable gripping element in a predetermined  
position such that the clip may grip a fabric tube or the like between the main  
10 gripping element and the moveable gripping element; a mechanism being  
provided which responds to a supply signal to move said other end of the  
moveable gripping element to release the grip.
2. A safety device configured to be actuated by the supply of gas, the safety  
15 device incorporating an outlet vent pipe, the outlet vent pipe being sealed by a  
releasable clip, the releasable clip having a first elongate main gripping  
element, and a second elongate moveable gripping element, the main gripping  
element having a retaining element to retain one end of the moveable gripping  
element; there being an arrangement to retain the other end of the moveable  
20 gripping element in a predetermined position such that the clip may grip the  
outlet vent pipe or the like between the main gripping element and the  
moveable gripping element; a mechanism being provided which responds to a  
supply signal to move said other end of the moveable gripping element to  
release the grip.
- 25 3. A safety device according to Claim 2 wherein the safety device is an air-  
bag.

4. A safety device according to Claim 2 wherein the safety device is a pretensioner.

5. A safety device according to Claim 2, 3 or 4 wherein a plurality of said  
5 releasable clips are provided, each clip being associated with a respective outlet hose.

6. A safety device according to any one of the preceding Claims wherein the releasable clip incorporates a spring initially held in a compressed state and  
10 released in response to said signal so as to move the said other end of the moveable retaining element.

7. A safety device according to any one of Claims 1 to 5 wherein the main gripping element is in the form of a cylinder, and said other end of the elongate  
15 moveable gripping element is configured to fit over or within the cylinder; there being a mechanism to supply gas to the interior of the cylinder in response to said signal to move the said other end of the moveable gripping element.

8. A safety device according to Claim 7 wherein said other end of the  
20 moveable gripping element is constituted by a piston movable within the cylinder.

9. A safety device according to Claim 8 wherein the cylinder has a terminal inward projection to retain the piston in the cylinder.

25

10. A safety device according to Claim 7 wherein said other end of the moveable gripping element comprises a closure cap dimensioned to close an open end of the cylinder.

11. A safety device according to any one of Claims 7 to 10 wherein the source of gas is a pyrotechnic squib.

5 12. A safety device according to any one of Claims 7 to 10 wherein the source of gas is a source of compressed gas.

10 13. A safety device according to any one of the preceding Claims wherein the moveable gripping element is provided with an elongate cylindrical gripping portion, one end of which is engaged in a retaining lug provided on the main gripping element.

15 14. A safety device according to any one of Claims 7 to 13 wherein the main gripping element is in the form of a cylindrical housing, and the moveable gripping element has inclined resiliently mounted walls to engage the exterior of the cylindrical main gripping element.

20 15. A safety device substantially as herein described with reference to and as shown in Figures 1 to 3 of the accompanying drawings.

16. A safety device substantially as herein described with reference to and as shown in Figures 1 to 5 of the accompanying drawings.

25 17. A safety device substantially as herein described with reference to and as shown in Figures 1 to 6 of the accompanying drawings.

18. A safety device substantially as herein described with reference to and as shown in Figures 7 and 8 of the accompanying drawings.



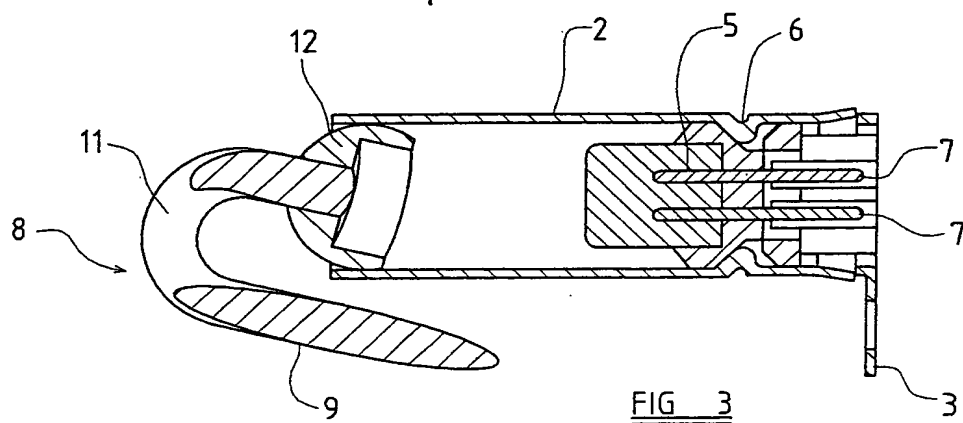
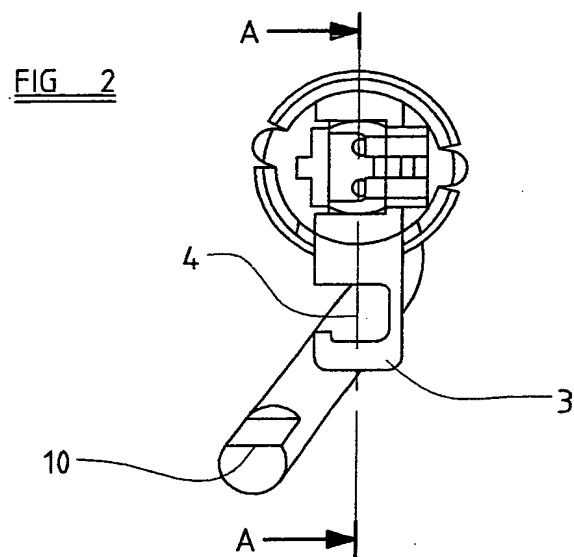
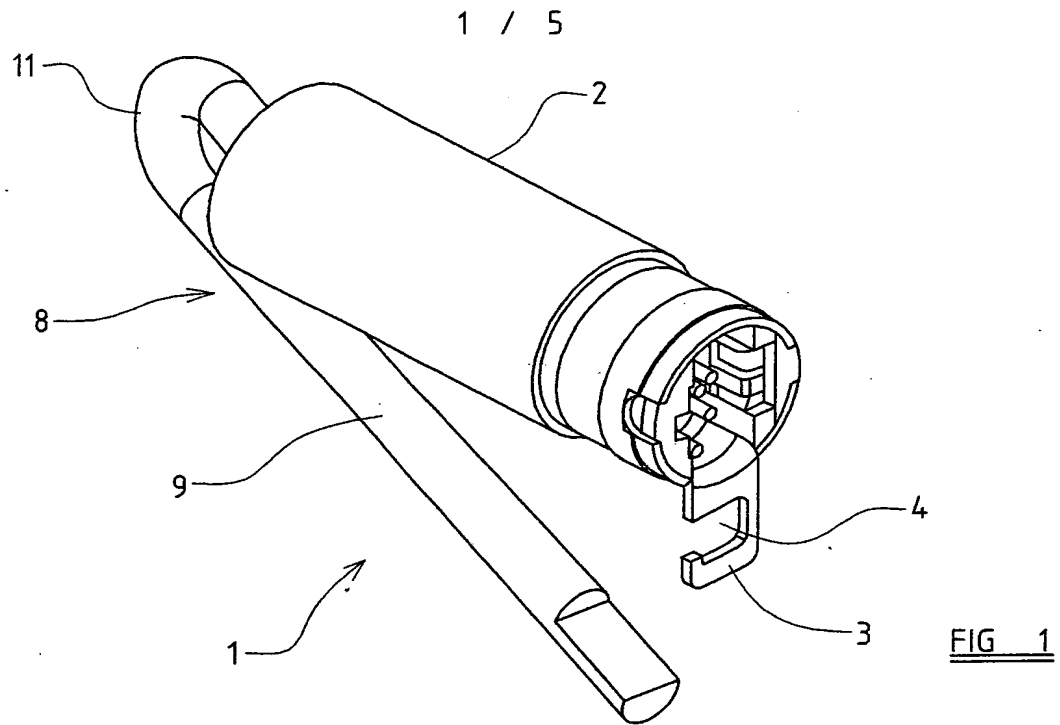
19. A safety device substantially as herein described with reference to and as shown in Figure 9 of the accompanying drawings.

5 20. Any novel feature or combination of features disclosed herein.

**ABSTRACT****“IMPROVEMENTS IN OR RELATING TO A SAFETY DEVICE”**

5

A safety device is disclosed which is configured to be actuated by the supply of gas. The safety device incorporates an outlet vent pipe (13, 21) which is sealed  
10 by a releasable clip (1). The releasable clip has a first elongate main gripping element (2) and a second elongate moveable gripping element (8). The main gripping element has a retaining element (3) to retain one end (10) of the moveable gripping element (8). The safety device also includes an arrangement to retain the other end of the moveable gripping element (8) in a predetermined  
15 position such that the clip (1) may grip a fabric tube or the like between the main gripping element (2) and the moveable gripping element (8). A mechanism is provided which responds to a supply signal to move said other end of the moveable gripping element to release the grip.



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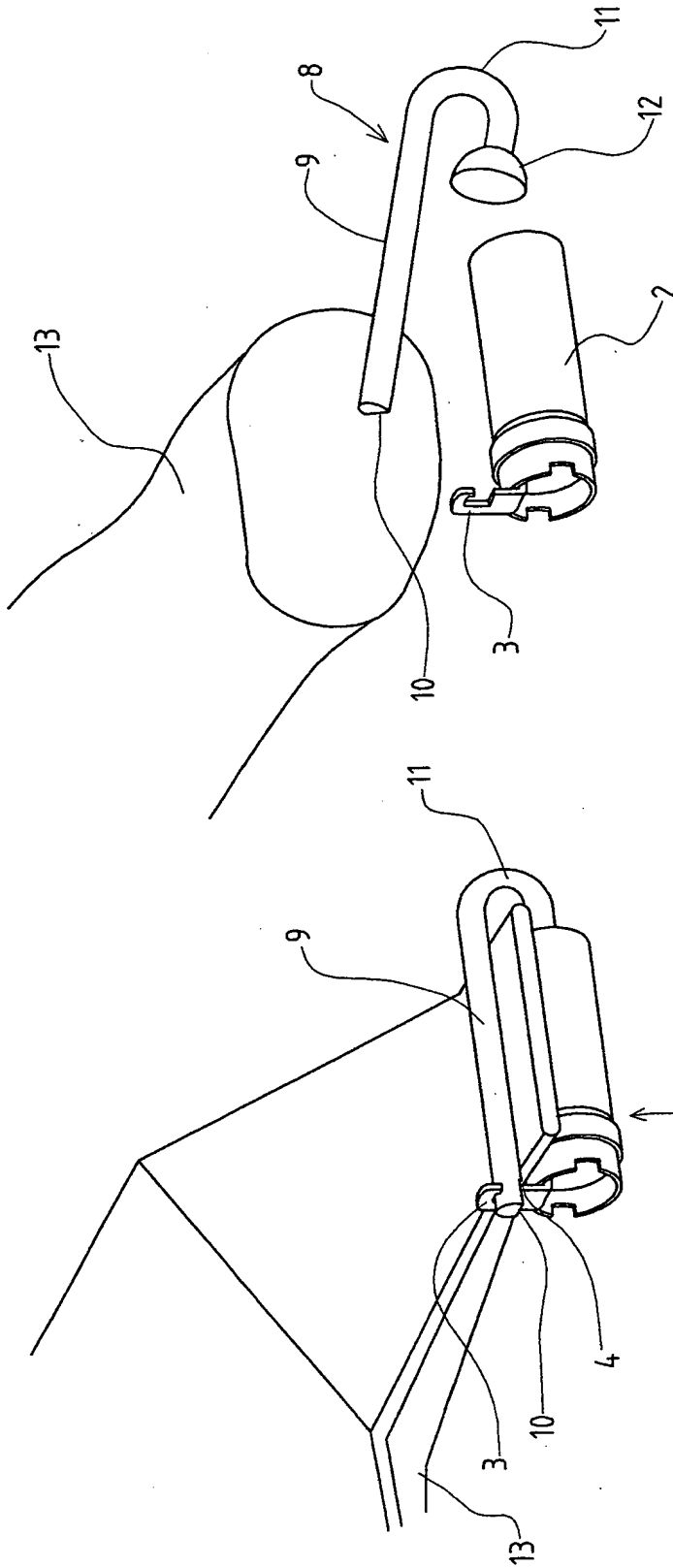


FIG 4

FIG 5

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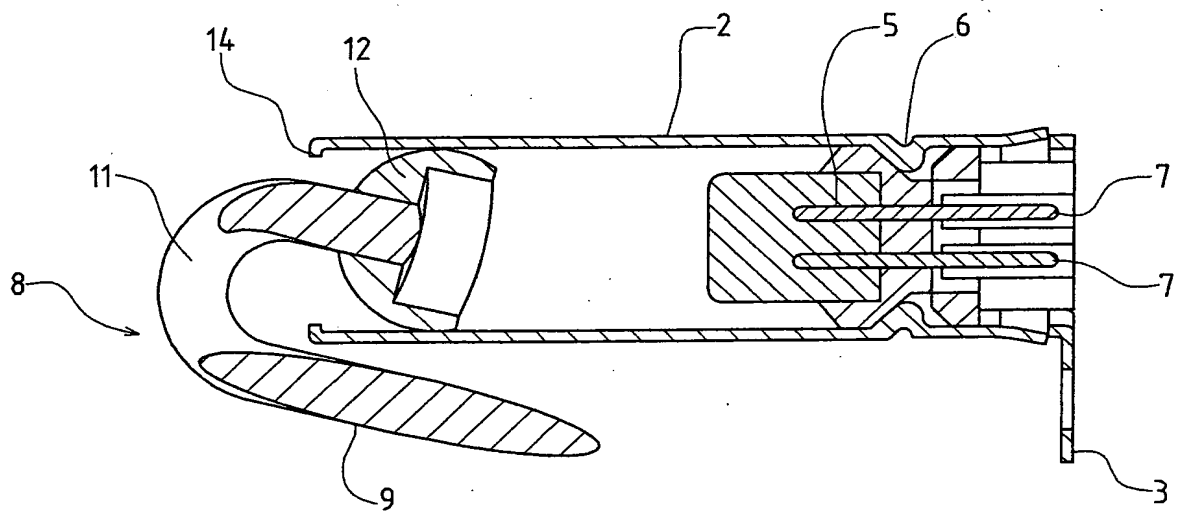


FIG 6

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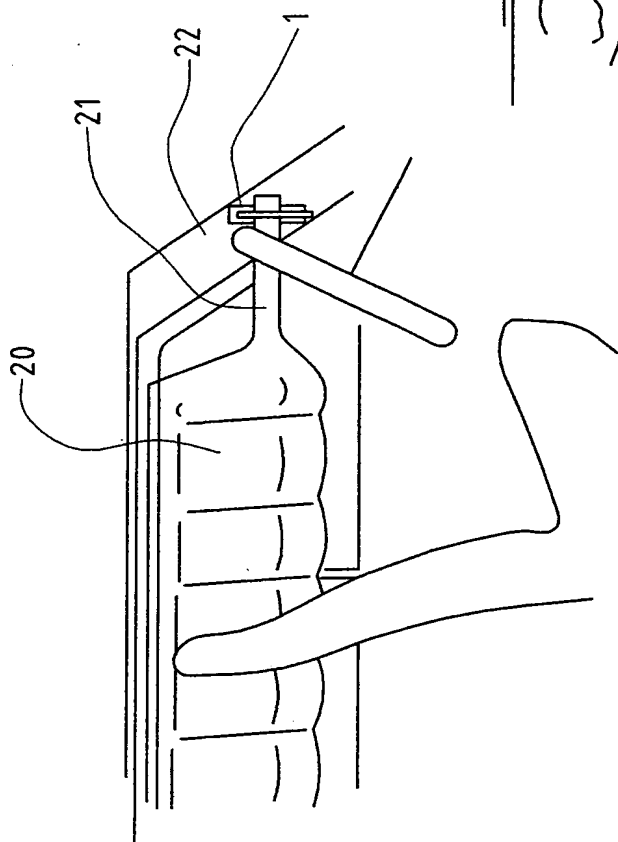


FIG. 7

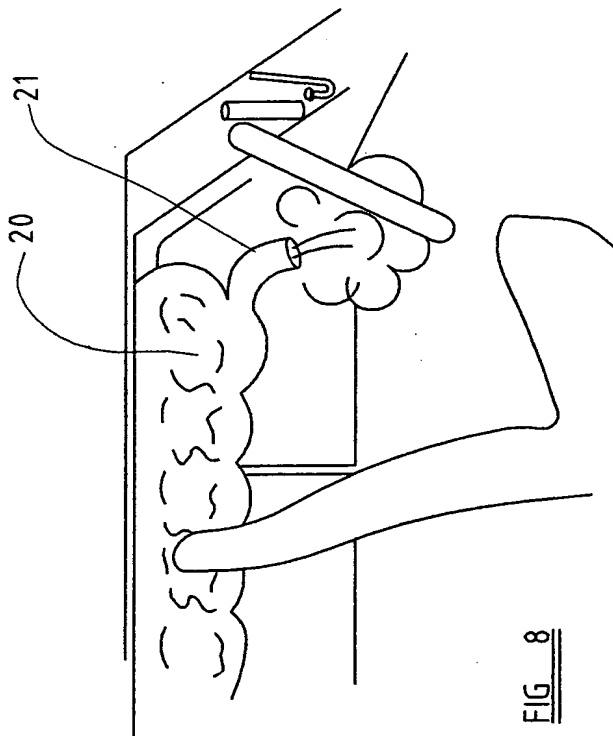


FIG. 8

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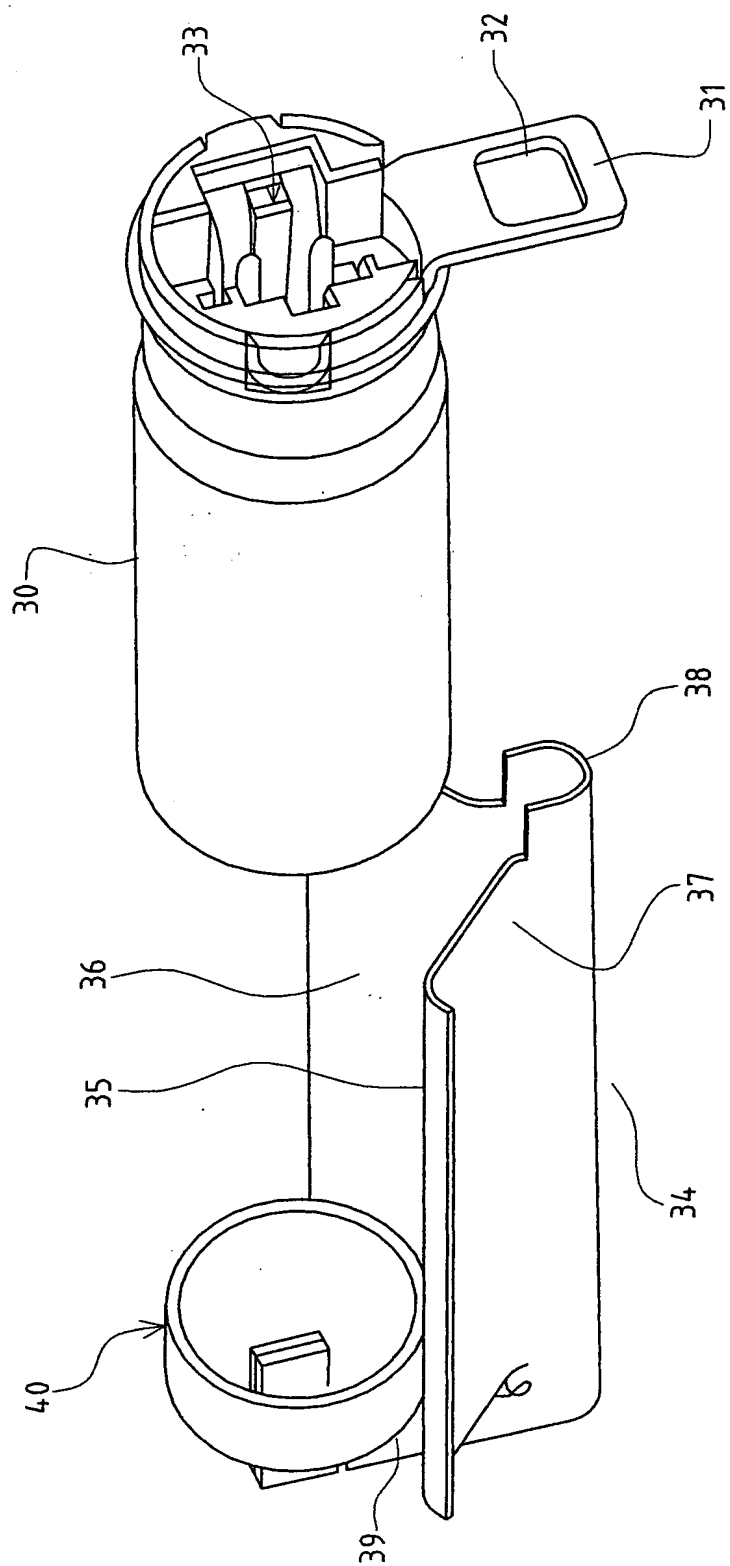


FIG 9

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